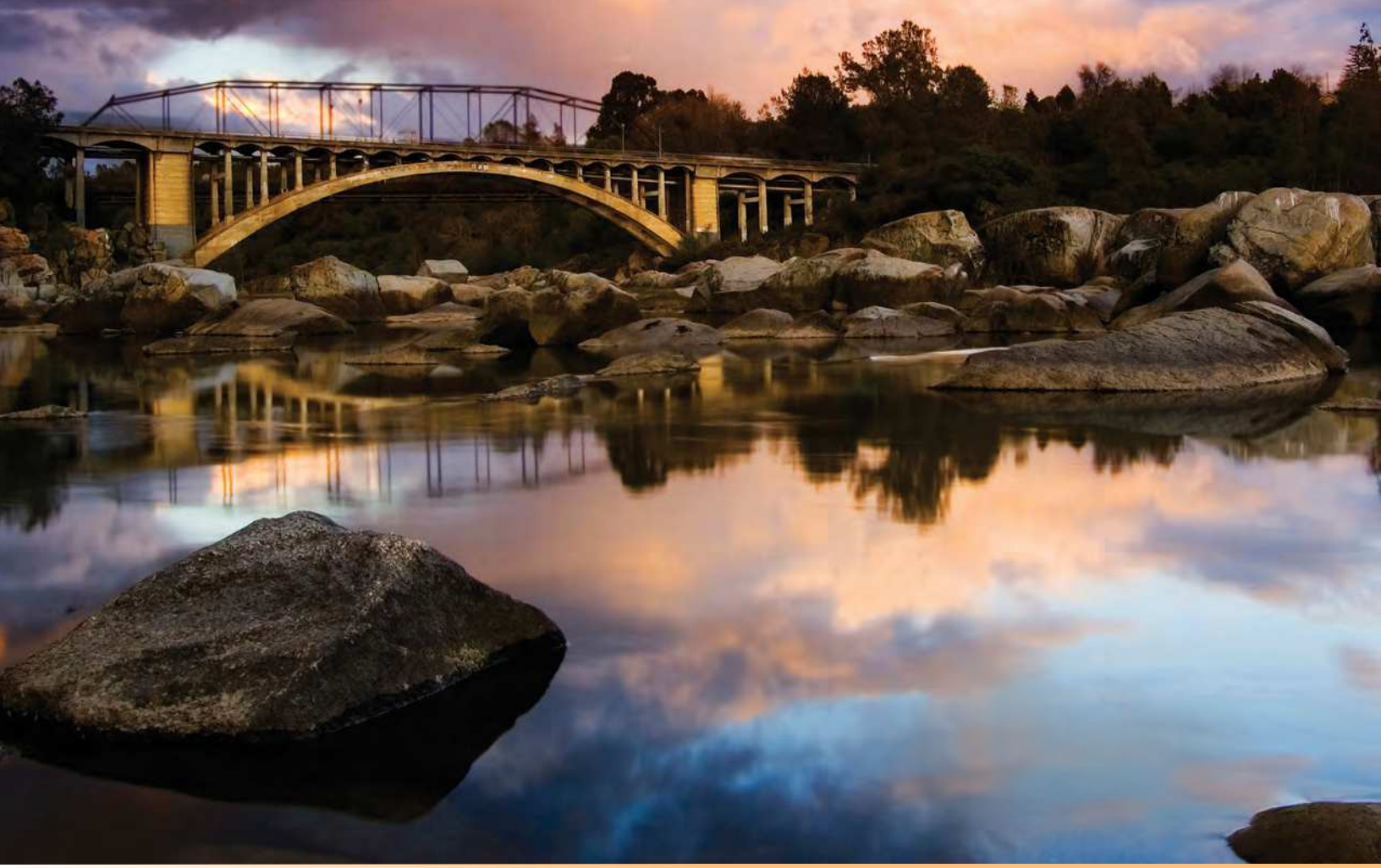

Sustainability Action Plan

To identify key initiatives and specific actions the City of Folsom can take to incorporate sustainability policies and procedures into municipal operations and maintenance practices.

City of Folsom
January 2017

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ACKNOWLEDGEMENTS

While many individuals and organizations contributed to this endeavor, the following individuals and organizations were instrumental in providing the guidance and inspiration needed to complete this plan.

REV® - Rev's flagship Sustainability Circle program contributed to this plan by providing a unique hybrid of education, expert resources and individualized consulting.

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EXECUTIVE SUMMARY

Focused on improving municipal operations sustainability efforts, the Sustainability Action Plan (SAP) for City of Folsom operations provides a framework and set of initiatives that support the City's strong commitment to providing quality services for its citizens (residents and businesses) in a fiscally prudent, socially responsible, and environmentally sensible way.

This Plan was developed by an inter-departmental team of City staff as part of a comprehensive 6-month peer learning program sponsored by the Sacramento Municipal Utility District (SMUD). The Plan includes an overarching vision, a set of guiding sustainable principles, and long-term performance objectives to help guide and inform Folsom's sustainability efforts. The Plan focuses on six key sustainability areas:

- Fostering a Culture of Sustainability
- Increasing Energy Efficiency
- Increasing Water Conservation
- Enhancing Waste Reduction and Recycling
- Reducing Greenhouse Gas Emissions
- Investing in Urban Forestry/ Reducing Heat Island Effect

This Sustainability Action Plan represents the City of Folsom's commitment to sustainability efforts. Many of the goals in this plan are ambitious, but achievable, and they will only have an effect on city quality of life if they are implemented in a concerted and thoughtful way. Accountability and continued engagement will be crucial in the implementation, updating, and success of the Sustainability Action Plan.

PURPOSE

With an emphasis on fiscal responsibility, improved quality of life, long-term operational efficiency, resource conservation and waste/pollution prevention, the purpose of this plan is to identify key initiatives and specific actions the City can take to incorporate sustainability policies and procedures into municipal operations and maintenance practices. In light of economic, social and environmental challenges that cities throughout California face now and anticipate in the future, the objective of this plan is to guide City operational efforts toward sustainability principles with measurable milestones set for the next five years with the expectation of continued retooling and updating in the future.

CULTURE

In order for the City of Folsom's sustainability efforts to truly take root, it is important to create and foster an internal culture that values and understands the City's sustainability goals. Thus, to assist in fostering an internal culture of sustainability, below is a list of initiatives intended to embed sustainable thinking into everyday city business practices and decision making.

Goal 1 - Foster a Culture of Sustainability		
Strategies	Initiatives	(Expected) Time Frame
Strategy 1: Engage and inform City staff about City sustainability efforts	1.1 Create and implement a city-wide employee conservation awareness program and publish conservation/sustainability articles in the City Employee Newsletter on a quarterly basis.	6 Months
	1.2 Incorporate sustainability language into the City's annual budget and individual departmental missions statements	1 Year
	1.3 Establish a city employee "green team" to promote City sustainability efforts and evaluate initiative performance.	6 Months
	1.4 Develop a sustainability education program to educate employees about sustainable practices. Examples may include: fieldtrips to recycling facilities, energy efficiency seminars, environmental conservation guest speakers, etc.	18 Months
Strategy 2: Engage and inform the public about City sustainability efforts	2.1 Strategically highlight the sustainability elements of City facilities and projects through the existing City Newsletter and other outreach channels.	6 Months
	2.2 Brand City sustainability efforts by adding plaques that identify and recognize the sustainable features of City facilities.	1 Year/ongoing
Strategy 3: Identify opportunities to meet sustainability goals through City infrastructure and capital improvement projects, programs, and plans	3.1 Evaluate infrastructure planning and maintenance processes to holistically incorporate and prioritize strategies in support of sustainability goals. Consider incorporating goals into Water System Optimization Plan, Transportation System Plan, Capital Improvement Plan, Pavement Management programs, etc.	18 Months
Strategy 4: Implement high achievable green building standards for municipal facilities, including new building project and major remodels	4.1 Develop demonstration projects (such as a sustainable designed restroom facility at Econome Park) and highlight the sustainability features to engage and inform citizens and employees. Focus opportunities to leverage existing resources including grants and rebates.	6 Months/ongoing
	4.2 Consider utilizing SMUD's Savings by Design program in designing future city facilities.	6 Months
	4.3 For all future City Projects (Fire Station 38, New Corp Yard, etc.,) consider adopting a City Green Building Standard that goes beyond the minimum standards set by the California Green Building Standards Code (CalGreen).	1 Year

ENERGY

"Sports Complex - Solar Project"

Completed in 2011 and funded in part by a US Department of Energy Grant totaling $656,100, the City of Folsom installed a solar panel array on the roof of the Sports Complex to help offset the building's energy costs.

More than 500,000 KW of solar energy produced so far.

Due to ever-changing building and development practices throughout the state of California, most buildings have varying degrees of energy efficiency. Many homes, businesses, as well as a range of City-owned properties are not considered to be energy efficient by today's high efficiency standards. Factors that affect the wide range in energy inefficiencies may include: deficient lighting systems and appliances, lack of sufficient building insulation, inefficient building envelope design, or aging HVAC systems. Responsible energy use is essential to scale down long term utility costs and reduce the environmental impacts caused as a result of energy production.

The City of Folsom relies on SMUD to power a wide range of municipal buildings, parks, streetlights, traffic signals, water treatment facilities, and other municipal services. And, while some cost and energy savings have already been achieved through the implementation of a number of energy saving actions, there exist many more opportunities for the City to achieve additional energy reductions and cost savings. Also, with the recent passage of the **Clean Energy and Pollution Reduction Act of 2015 (SB-350)**, energy prices are anticipated to increase over the next few years.

Current Actions

Actions	Description
Energy Efficient Traffic Signals and Lighting	In 2015, the City began retrofitting 80 High Pressure Sodium street lights at 10 intersections with energy efficient LED street lights. During 2016, an additional 80-100 lights were retrofitted.
Park Maintenance	In 2015, the City converted the Aquatic Center, Livermore Park, Cohn Park and Davies Park area lighting to LED for energy efficiency and cost reductions of future lighting and maintenance.
Sports Complex Roof-top Photovoltaic System	A 75 kW photovoltaic system was installed on the roof of the Folsom Sports Complex in 2011. This system produces approximately 35% - 45% of the annual electrical power need of the facility and has an estimated annual energy cost savings of over $10,000.

The City of Folsom remains committed to continuing reductions in its municipal energy consumption. Below is a brief snapshot of the City's future goals intended to further decrease the environmental impacts resulting from energy consumption and production.

Goal 2 - Increase Energy Efficiency by 20% in 5 years

Strategies	Initiatives	Expected Time Frame	Metrics Goals
Strategy 1: Measure and track energy use	1.1 Utilize Portfolio Manager, SMUD's Online Energy Profiler, or other energy usage tools to establish baselines for each municipal building/facility.	6 Months	Establish a 2014 comparison baseline
Strategy 2: Reduce energy consumption from City facility operations by 5% within 2 years through additional energy efficiency and resource conservation techniques	2.1 Develop energy use / plug load procedures for City facilities and engage employees in the implementation process. For example, computer shut down, use of task lighting and removal of personal space heaters.	1 Year	Measure reduction in average kWh used
	2.2 Systematically evaluate effectiveness of existing systems to automate energy use and implement energy conservation measures such as automatic HVAC system shutdowns, additional room lighting sensors, automatic computer shutdowns, or any other identified energy reduction opportunities.	1-2 Years	N/A
Strategy 3: Continue to install energy efficiency upgrades in City facilities (buildings, parks, and infrastructure) to achieve an overall 20% reduction in City Facility energy usage within 5 years	3.1 Evaluate facilities energy use to identify key areas where energy upgrades are needed and consider the following: Additional lighting retrofits building weatherization, and mechanical/HVAC upgrades.	6 Months	N/A
	3.2 Identify funding sources for energy efficiency improvements.	18 Months	Measure number of funding sources procured
	3.3 Continue implementation of sports field lighting retrofit program utilizing automation to reduce incidence of lighted fields with no use.	Continuous	Measure number of lights replaced/retrofitted
	3.4 Continue to retrofit streetlights with LEDs for energy efficiency and reduced maintenance.	Continuous	Measure number of lights replaced/retrofitted
Strategy 4: Collaborate with the City's Strategic Account Advisor from SMUD to solicit expert advice and learn about available incentives	4.1 Identify additional opportunities to install photovoltaic systems to further offset the electrical power used in City operations.	1 Year and ongoing	Identifiable areas for additional photovoltaic system improvements

WATER

Turf Removal Projects: A Water-Smart Redesign

Estimated water savings from the 13 projects implemented in 2015 and 2016 is currently 1,185,600 gallons per year

The City of Folsom is committed to maximizing water use efficiency in its operations to promote the sustainability of this precious natural resource. A citywide focus on water conservation and responsible water use is paramount to ensuring the sustainability of this precious natural resource.

Water conservation remains an important part of life in California and the City will continue its commitment to reduce per capita water use as required by state mandate. To achieve water savings while improving water use efficiency, the City continues to support a number of innovative water saving programs. To date, Folsom has implemented a number of programs that have resulted in reduced water consumption in all City operations and within the Folsom community.

Current Actions

Actions	Description
Street Median and Streetscape Turf Removal Project	Retrofit city owned medians and streetscapes to replace turf with materials that require little to no water. To date, about 2 acres of medians have been changed, with more planned.
Drip Systems and Smart Irrigation Controllers	City owned parks and other landscapes are in a retrofit process. Drip systems and water saving "Smart Irrigation" controllers are being installed to further reduce water use in municipal landscaping.
"Going Golden"	The Folsom Parks Department has implemented a policy of "Going Golden" during times of drought in areas of City that are less likely to see heavy public use.
Water-Flow Sensors	Folsom parks and other maintained city landscapes are currently under a retrofit process with water flow sensors that will allow for the identification and automatic water shutoff in the event of irrigation pipe breaks or leaks.
New Technology	Environmental and Water Resources Department is currently using a variety of new technologies to encourage conservation and water use efficiency. These technologies include: • Advanced Meter Infrastructure – An electronic meter reading system installed on all City water meters that allow access to meter reads on an hourly basis. This system can identify water use anomalies or continuous water flow and notify City staff of possible water leaks. • OmniEarth – A geographical information system (GIS) program that will develop customer level water budgets based on irrigable land. Actual water use at City facilities can be compared to estimated water needs calculated by the water budget.

The Water-Energy Nexus

Providing California with drinking water requires significant amounts of energy.

Energy is used to obtain, transport, and treat water from a number of different sources. In contrast, energy production requires vast amounts of water. The connection between these two valuable resources is known as the **Water-Energy Nexus**.

Recent research performed by the California Energy Commission shows water-related electricity usage is 48 terawatt-hours (TWh) per year. That amount of energy accounts for 20% of California's total electrical use.

In order to achieve additional water saving measures, the City of Folsom will continually refine its water conservation policies in a relentless effort to maximize conservation while minimizing consumption.

Goal 3 - Increase Water Conservation Efforts			
Strategies	Initiatives	(Expected) Time Frame	Metrics Goals
Strategy 1: Assess and prioritize water conservation opportunities on all City properties and in City maintained landscapes	1.1 Continue to refine irrigation applications to maximize water conservation and minimize water consumption, including the retrofit of sprinkler nozzles to low-volume models when and where appropriate.	Continuous	Measurable reductions in annual water usage
	1.2 Identify additional opportunities to incorporate water wise, native landscaping into City facilities and parks grounds.	Continuous	N/A
	1.3 Implement cost-effective water efficiency upgrades at City facilities including: water smart fixtures, low-flow toilets, and water flow sensors.	3-5 Years	Gallons of water saved annually
Strategy 2: Reduce water waste associated with irrigation systems that occur as a result of overwatering, leaks and breaks	2.1 Install central control irrigation systems where feasible. Central control systems allow managers to control irrigation systems from a personal computer, tablet, or mobile device. This system will allow adjustments to watering schedules and provide automated reports of pipe breaks or other problems with the irrigation system.	3-5 Years	Gallons of water saved annually Reduced staff costs associated with manual adjustment
	2.2 Repair, restore, and add water flow sensors to all irrigation systems operated and maintained by the City that are currently equipped with central control systems.	2 Years	Measurable reduction in water waste associated with breaks and leaks
Strategy 3: Engage City staff with a variety of innovative outreach, educational, and assistance programs	3.1 Perform large landscape irrigation audits for City facilities, parks and streetscapes.	Continuous	Measurable increase in water use efficiency
	3.2 Provide training and education to City staff on water efficient irrigation and sustainable landscape practices.	Continuous	Encourage a more sustainable water use mindset among staff
	3.3 Consider partnering with local residents and/or businesses to create a water efficient demonstration garden in a location easily accessible to the public. Highlight drought tolerant and low water use trees, plants and shrubs using the latest technology in efficient landscape equipment.	2 Years	Reduce water use by encouraging less lawn and more climate appropriate landscape options

Elvie Perazzo Briggs Park
Water Conservation

Strategic Gold:

The Folsom Parks Department has made numerous system wide adjustments to reduce the amount of water used to keep our parks healthy. A water management priority system has been developed to identify and prioritize the areas in the city parks that can “go gold.” Folsom is committed to continuing to preserve its park systems while at the same time meeting our responsibility to actively conserve water.

WASTE RECYCLING

The average California citizen discards roughly 4.3 pounds of waste per day. Folsom generates approximately 1,400 tons of waste every week. Recycling programs are imperative to reducing the amount of waste that gets sent to our landfills and greatly assists in the conservation of natural resources. Solid waste diversion can also be achieved by composting and separating waste to effectively dispose of reusable and organic materials. Recycling helps to create a cycle in which reusable products never enter landfills. Over the past decade, the City of Folsom has made significant steps toward increasing its waste diversion and recycling efforts.

Current Actions

Actions	Description
Replace Paper Towel Dispensers in Municipal Restrooms with Hand Dryers	In an effort to reduce the paper waste associated with drying towels, hand dryers are being incrementally installed in park restrooms facilities.
Procurement Policy 303	This internal City policy supports the purchase of recycled and environmentally preferred products from localized vendors in order to minimize the impacts of the City's work effort.
Construction Debris Ordinance (FMC Ord NO. 1056) & California Green Building Code	This Ordinance is designed to comply with California Recycling Law (AB 939) and the California Green Building Code. All construction projects over $100,000 in cost are required to submit a waste management plan. The WMP will help ensure that at least 65% of all construction debris is recycled.
Door-to-Door Hazardous Material Recycling Program	The Folsom HAZMAT team offers door to door Household Hazardous Waste pickup to all residents in an effort to reduce hazardous waste products in landfills and storm drains.

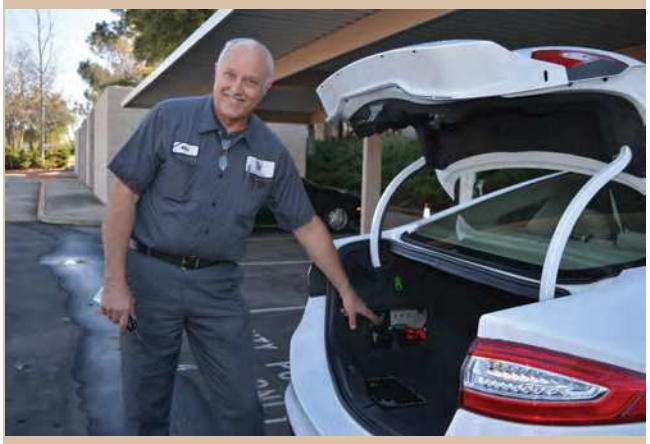
How is Folsom doing in meeting the State's recycling requirements?

Since the implementation of it's curbside recycling program in 2005, the City of Folsom has consistently met or exceeded the State's 50% landfill diversion requirements.

Although the City of Folsom has taken a number of progressive steps towards reducing the waste generated citywide, there is more that can be done to enhance waste reduction and recycling efforts that pertain to city operations. A revitalized list of our future municipal waste reduction initiatives can be seen below.

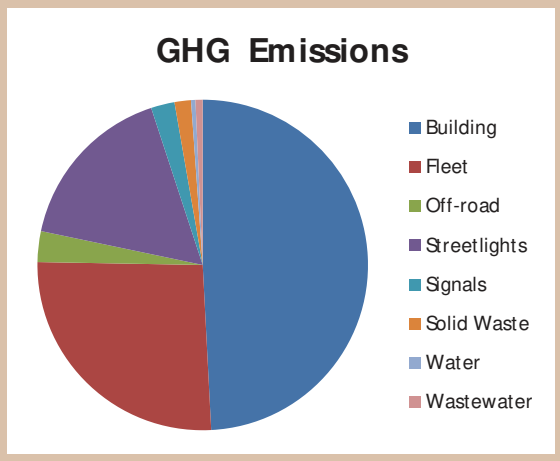
Goal 4 - Enhance Waste Reduction and Recycling Efforts			
Strategies	Initiatives	(Expected) Time Frame	Metrics Goals
Strategy 1: Comply with AB 1826 by creating a City-wide organics recycling program to reduce organic waste by 10% by 2020	1.1 Consider designating an area to stage and produce woodchips from plant trimmings performed on City property.	3-5 years	Reduction in organic waste sent to the landfill Reduced costs in landscaping materials
Strategy 2: Expand recycling programs at City facilities and properties to ensure a goal of 75% diversion by 2020 to meet state wide goal prescribed under AB 341	2.1 Continue to expand the number of recycling containers at City facilities and properties to capture more recyclables that are currently going to the landfill. 2.2 Follow best management practices and provide consistent and easy-to-read signage and continue to educate employees on the proper procedures for efficient recycling.	Continuous	Increase in recyclable content diverted from landfill – Increased employee awareness
Strategy 3: Expand on City policy to reduce its waste and cost of supplies	3.1 Continue to replace paper towel dispensers in Municipal facilities with hand/air dryers to reduce paper towel waste where practical. 3.2 Set printer default settings for duplex printing.	Continuous	Reduction in generated paper waste
Strategy 4: Use recycled-content procurement policies and procedures to expand the use of products made from recycled materials	4.1 Provide training for Department Administrative staff emphasizing the City's environmentally preferred purchasing policies. 4.2 Evaluate centralized purchasing to streamline purchase of goods and services that meet sustainability goals.	1-2 Year	Increase in environmentally friendly purchasing
Strategy 5: Asphalt Overlay Recycling	5.1 Recycle material used to create asphalt. Reduce waste, reduce costs for new materials, reduce trucking for both waste and new material, increase road repaving efficiency.	1 Year	Reduction in new hot mix asphalt purchasing

TRANSPORTATION/GHG REDUCTION



According to a 2013 report conducted by the United States Environmental Protection Agency, vehicle travel accounts for nearly 27% of all Greenhouse Gas (GHG) emissions in the US. The largest sources of these transportation GHG include passenger cars, light-duty trucks, sport utility vehicles, pickups, and minivans.

In order to perform a broad range of daily municipal operations, the City of Folsom maintains and relies on a sizeable vehicle fleet. As a result, GHG emissions from City fleet account for roughly 26% of the City GHG emissions that are attributed to City of Folsom governmental operations (Source: City of Folsom 2014 Greenhouse Gas Emissions Inventory Update by Ascent Environmental). In order to combat the amount of GHG produced as a result of standard municipal activities, the City of Folsom has begun taking steps to reduce its overall carbon footprint.



Sector:	CO^2e (Metric Tons)	Percent Total
Building Energy Use	2,137	49.0%
Total On-Road - City Fleet and Employee Commute	1,150	26.0%
Off Road Vehicles and Equipment	138	3.0 %
Streetlights	727	16.6%
Traffic Signals	101	2.3%
Solid Waste Generation	71	1.6%
Water-Related (treatment)	15	0.43%

Current Actions

Actions	Description Expected Completion Date
Electric Vehicle Charging Stations	City Hall currently has four electric vehicle charging stations that are used to charge flex-fuel and electric vehicles in the city fleet.
AFV/Electric Vehicles in City Operations	As the cost of alternative fuel vehicles and electric vehicles continues to drop, Folsom has begun to convert pool vehicle fleet to eco-friendly alternatives. Currently, there are six hybrid vehicles in the City fleet.
Aquatic Center Solar Array	The City installed its first solar photovoltaic system in 2002 at the Aquatic Center.
Folsom Sports Center Solar Arrays	Completed in 2011, the solar panel arrays installed on the roof of the Sports Center have saved over 360 tons of CO^2 by reducing the demand for energy production.

Action to reduce GHG emissions is a priority in the City of Folsom. Although positive steps have been taken to reduce the City's carbon footprint, additional action planning and goal setting will strengthen the City's ability to further reduce environmental impacts created as a result of daily municipal operations.

Goal 5 – Transportation & Greenhouse Gas Reduction			
Strategies	Initiatives	(Expected) Time Frame	Metrics Goals
Strategy 1: Reduce consumption of carbon-intensive fuels related to business travel and fleet vehicles by 10% in the next 5 years	1.1 Continue purchasing alternative fuel/technology vehicles when replacing vehicles in existing fleet. 1.2 Take actions to reduce vehicle miles traveled related to city operations. Potential actions may include: • Install timer locks on all City owned restroom facilities – reducing the vehicle travel needed to manually lock/unlock these facilities. • Revise City Design Review process so employees only need to post a notice at the site once. • Allow online credit card payments for certain Community Development Permits - reducing applicant's need to drive to City Hall.	Continuous	Reduction in greenhouse gas emissions produced from municipal vehicle travel
Strategy 2: Install infrastructure to support alternative fuel fleet	2.1 Explore options to install EV Quick Charge stations at City facilities to support fleet vehicles. 2.2 Explore installing a compressed natural gas (CNG) fuel facility in the new Corp Yard so that the City can convert fleet to CNG-fueled heavy vehicles.	3-5 Years	Create infrastructure to support growing Electric/AFV fleet
Strategy 3: Explore opportunities to reduce employees Vehicle Miles Traveled	3.1 Develop and implement employee ride share or similar alternative transportation program. Encourage employees to utilize car pooling or alternative public transportation methods in order to reduce the amount of vehicle miles traveled during employee commutes.	2 Years	Reduce vehicle miles traveled

The City has four electric vehicle charging bays and six hybrid vehicles so far.

Alternative fuels, electric vehicles, and other cleaner forms of transportation will help the City of Folsom reduce the amount of GHGs it produces as a result of daily municipal operations.

URBAN FORESTRY/HEAT ISLAND

"Heat Island Effect"

Heat islands develop in urbanized areas as natural vegetation gives way to asphalt, concrete, rooftops and other man-made materials.

Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and water quality.

Urban forests are dynamic ecosystems that provide a wide range of public benefits. Folsom's urban forest refers to all trees and vegetation within the City and includes the following public and privately held green spaces: parks, promenades, greenways, natural preserves, open space, river/lake/stream corridors, street medians, HOA open space and, golf courses. Folsom's parks and open natural spaces serve important roles in their contribution to Folsom's unique culture, heritage, economy and "sense-of-place". Green spaces like these offer recreational and passive opportunities and serve as a valuable climate change adaptive resource. Trees and other living, growing plants of all sizes help clean the air, reduce GHG, provide the much needed cooling for our hot summer climate, control stormwater, reduce wind and water erosion, mitigate city–type "heat island effects" and reduce noise. Furthermore they improve property values, reduce crime, calm traffic, enhance parking lots (which leads to more shopping and visiting time) and promote community pride.

Trees are an especially important natural resource that help mitigate the "Heat Island Effect" for the City of Folsom. The term "heat island" describes built up (urban) areas that are hotter than nearby rural areas. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and water quality. Besides trees, other ways to reduce the heat island effect, include utilization of heat reflective materials and/or green building standards.

The City of Folsom supports the Sacramento Tree Foundation's ***Green-Print Initiative.***

Since its conception in 2001, the City of Folsom has been a proud contributor to the Sacramento Tree Foundation's "Green Print Initiative." This initiative is a call to action for all local municipalities and citizens to contribute to actionable urban forestry efforts. Under the Green Print Initiative is a campaign to plant 5 million new trees in the Sacramento region over the next forty years. 5,000 local area trees can bring a wide range of benefits including:

- *925 tons of carbon sequestration daily*
- *Water quality improvements and reduced stormwater discharges*
- *$50 Million in annual energy savings*
- *1,250,000,000 gallons of rainwater collected annually*
- *Natural habitats for millions of local wildlife creatures*

Goal 6 – Urban Forestry and Heat Island Reduction

Strategies	Initiatives	(Expected) Time Frame	Metrics Goals
Strategy 1: Develop and implement an urban forest plan	1.1 Develop a plan to care for, monitor and continue to plant City maintained trees to encourage a healthy tree canopy in City facilities. 1.2 Complete the Street Tree Inventory to help the City identify potential tree issues, reduce exposure to liability, help save existing trees, and to help reduce the heat island effect.	3-5 Years	Identify areas for additional greenspace (urban forest) opportunities
Strategy 2: Continue the City's campaign to plant more trees to promote a healthy urban forest	2.1 Consider developing a citywide plan that encourages 30-50% more shade for all paving: streets, sidewalks, bike paths and other non-pervious and pervious covered areas. 2.2 Develop information, guidelines and recommendations on how best to ensure that the existing Folsom Municipal Code goal of 40% shade in parking lots in 15 years is met.	1-2 Years 3-5 Years	Further reduce the "heat island" effect Increased compliance
Strategy 3: Update and refine Folsom Municipal Code regarding tree preservation	3.1 Consider updating the Folsom Municipal Code relating to tree preservation consistent with urban forestry best practices in order to promote a healthy urban forest.	1-2 Years	Encourage Urban Forestry efforts
Strategy 4: Identify opportunities to utilize cool paving materials	4.1 Investigate cool pavement technologies, including permeable pavements, to discern their appropriateness for specified paved surfaces such as, streets, parking lots, bike trails, alleys, sidewalks, etc. 4.2 Develop cost-benefit analysis of cool pavement technologies to identify Public Works maintenance benefits of alternative pavements. 4.3 Explore opportunities to receive grant funding to develop a cool pavement demonstration project.	1-2 Years 1-2 Years 1-2 Years	Further reduce the "heat island" effect Reduced maintenance costs N/A
Strategy 5: Utilize concrete instead of asphalt for streets and trails	5.1 Develop Design and Construction Specifications allowing the use of Roller-Compacted Concrete (RCC) in new development.	1-2 Years	N/A

According to the USDA Forest Service, trees properly placed around buildings can reduce air conditioning needs by 30 percent and save 20-50 percent in energy used for heating.